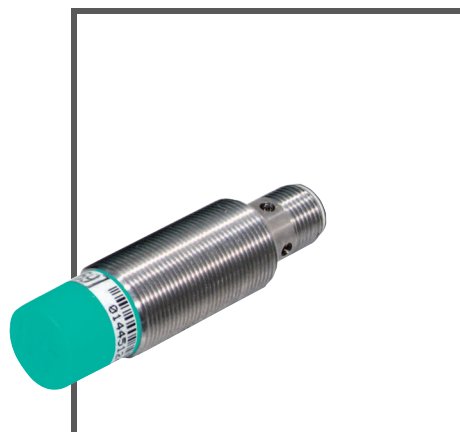


MANUAL

**IQT2-\*-R4-V1**

**RFID Read/Write Stations,  
13.56 MHz**



CE

With regard to the supply of products, the current issue of the following document is applicable: The General Terms of Delivery for Products and Services of the Electrical Industry, published by the Central Association of the Electrical Industry (Zentralverband Elektrotechnik und Elektroindustrie (ZVEI) e.V.) in its most recent version as well as the supplementary clause: "Expanded reservation of proprietorship"

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# 1 Introduction

## 1.1 Content of this Document

This document contains information required to use the product in the relevant phases of the product life cycle. This may include the following:

- Product identification
- Delivery, transport, and storage
- Assembly and installation
- Commissioning and operation
- Maintenance and repair
- Troubleshooting
- Dismounting
- Disposal

The documentation comprises the following parts:

- Present document
- Datasheet

In addition, the documentation may comprise the following parts, if applicable:

- EC-Type Examination Certificate
- EC Declaration of Conformity
- Attestation of conformity
- Certificates
- Control drawings
- Other documents

## 1.2 Target Group, Personnel

Responsibility for planning, assembly, commissioning, operation, maintenance, and dismounting lies with the plant operator.

Only appropriately trained and qualified personnel may carry out mounting, installation, commissioning, operation, maintenance, and dismounting of the product. The personnel must have read and understood the instruction manual and the further documentation.

Prior to using the product make yourself familiar with it. Read the document carefully.

## 1.3 Symbols Used

This document contains symbols for the identification of warning messages and of informative messages.

### Warning Messages

You will find warning messages in instances, whenever dangers may arise from your actions. It is mandatory that you observe these warning messages for your personal safety and in order to avoid property damages.

Depending on the risk level, the warning messages are displayed in descending order as follows:



#### ***Danger!***

This symbol indicates an imminent danger.

Non-observance will result in personal injury or death.



#### ***Warning!***

This symbol indicates a possible fault or danger.

Non-observance may cause personal injury or serious property damage.



#### ***Caution!***

This symbol indicates a possible fault.

Non-observance could interrupt the device and any connected systems and plants, or result in their complete failure.

### Informative Symbols



#### ***Note!***

This symbol brings important information to your attention.



#### **Action**

This symbol indicates a paragraph with instructions. You are prompted to perform an action or a sequence of actions.



## 2 Product Description

These products are read/write stations equipped with a RS-485 serial interface. The read/write stations write to and read from read/write tags in the 13.56 MHz frequency range in line with ISO 14443. The devices are connected via M12 plugs.



Figure 2.1      IQT2-18GM-R4-V1

## 3 Installation

### 3.1 Storage and Transport

For storage and transport purposes, package the unit using shockproof packaging material and protect it against moisture. The best method of protection is to package the unit using the original packaging. Furthermore, ensure that the ambient conditions are within allowable range.

### 3.2 Unpacking

Check the product for damage while unpacking. In the event of damage to the product, inform the post office or parcel service and notify the supplier.

Retain the original packaging in case you have to store or ship the device again at a later date.

Should you have any questions, please contact Pepperl+Fuchs.

### 3.3 Mounting and Connecting the Read/Write Station



#### **Note!**

Do not mount the read/write station on metal surfaces. Maintain a **minimum distance of 50 mm** between the device and any metals.

If you want to mount multiple devices side by side, keep a **minimum distance of 210 mm** between them to avoid interference.

Ensure the device is mounted on a level surface.



#### **Warning!**

Processes started in an uncontrolled manner jeopardize the plant

Before commissioning, ensure that there are no risks involved in using the device that may endanger the plant.



### Mounting and Connecting

1. Attach the IQT\*-F61-R4-V1 read/write station using two screws or the IQT\*-FP-R4-V1 read/write station using four screws by feeding the screws through the mounting holes in the housing.  
Attach the IQT\*-18GM-R4-V1 read/write station using suitable mounting materials, e.g., nuts or mounting aids.
2. Connect the device to a higher-level computer that features an RS-485 interface.
3. The read/write stations have an internal terminator on the RS-485 interface. For this reason, only one read/write station is provided within an RS-485 network. It is not possible to build an RS-485 network with multiple read/write stations.

### Power Supply

The device may only be operated using a limited-power current source, in accordance with EN 60950.

## 4 Operation

### 4.1 General Information about Tag Types

#### Read/write tag 13.56 MHz (inductive)

Read/write tags in this frequency range offer a considerably higher reading speed than read/write tags for the 125 kHz system. Since this is a nonproprietary system, cost-effective read/write tags are available from many third-party manufacturers.

By using a command, you can tell the device the specific read/write tag with which it is to communicate.

IQT2-\*-V1 read/write stations currently support the following read/write tags:

#### 13.56 MHz/ISO 14443 Tag Types

Tag type	Chip type	Details	Pepperl+Fuchs designation	Access	Bit/byte
40	ISO 14443-conformant	All ISO 14443-conformant read/write tags	IQC40 <sup>1</sup>	Read/write read-only code	- 32/56 bit
41	MF0 UL1101	Mifare Ultralight from NXP	IQC41	Read/write read-only code	384 bit 56 bit
42	MF1 S5009	Mifare Classic 1 kBit from NXP	IQC42	Read/write read-only code	6016 bit 56 bit
43	MF1 S7009	Mifare Classic 4 kBit from NXP	IQC43	Read/write read-only code	3440 byte 56 bit

Table 4.1 13.56 MHz tag types in accordance with ISO 14443

1. This tag type is used to read the UID (read-only code) from all ISO 14443-conformant tags supported by Pepperl+Fuchs.

The memory of type 41 read/write tags is divided into blocks that are four bytes in length. In the case of type 42 and type 43 read/write tags, the blocks are 16 bytes in length. When a read/write command is issued, the start address and requested number of data blocks is indicated for access purposes.



## 4.2 Command Overview

The commands in the list are described in detail on the following pages.

### System commands

Command description	Abbreviation	Single drop	Multidrop
		Page	Page
version	<b>VE</b>	See "Version VE" on page 10	See "version VE" on page 13
define function	<b>DF</b>	See "Define Function DF" on page 13	See "Define Function DF" on page 13
set device address	<b>SD</b>	-	See "Set Device Address SD" on page 13
get device address	<b>GA</b>	-	See "Get Device Address GA" on page 13
get state	<b>GS</b>	See "Get State GS" on page 11	See "Get State GS" on page 15
get data	<b>GD</b>	-	See "Get Data GD" on page 15
change tag	<b>CT</b>	See "Change Tag CT" on page 10	See "Change Tag CT" on page 14
quit	<b>QU</b>	See "Quit QU" on page 10	See "quit QU" on page 14
configure interface	<b>CI</b>	See "Configure Interface CI" on page 11	See "configure interface CI" on page 14
reset	<b>RS</b>	See "Reset RS" on page 11	See "reset RS" on page 14
command store	<b>CS</b>	See "Configuration Store CS" on page 11	See "Command Store CS" on page 14

### Standard read/write commands

#### Reading Data

Command description	Abbreviation	Single drop	Multidrop
		Page	Page
single read words	<b>SR</b>	See "Single Read Words SR" on page 11	See "Single Read Words SR" on page 15
enhanced buffered read words	<b>ER</b>	See "Enhanced Buffered Read Words ER" on page 12	See "Enhanced Buffered Read Words ER" on page 15

#### Writing Data

Command description	Abbreviation	Single drop	Multidrop
		Page	Page
single write words	<b>SW</b>	See "Single Write Words SW" on page 12	See "Single Write Words SW" on page 15
enhanced buffered write words	<b>EW</b>	See "Enhanced Buffered Write Words EW" on page 12	See "Enhanced Buffered Write Words EW" on page 15
fill datacarrier	<b>S#</b>	See "Fill Datacarrier S#" on page 12	See "Fill Datacarrier S#" on page 16



### Read-Only Code

Command description	Abbreviation	Single drop	Multidrop
		Page	Page
single read read-only code	<b>SF</b>	See "Single Read Read-Only Code SF" on page 12	See "Single Read Read-Only Code SF" on page 16
enhanced buffered read read-only code	<b>EF</b>	See "Enhanced Buffered Read Read-Only Code EF" on page 12	See "Enhanced Buffered Read Read-Only Code EF" on page 16

## 4.3 System Commands in Point-to-Point Operation (Single Drop)



**Note!**

**Command Syntax**

IQT2-\*-R4-V1 read/write stations are set to single-drop mode at the factory. In this mode, the read/write station first executes the respective command and then sends the response. This can take a few seconds, depending on the command.

If your read/write station is not operating in multidrop mode, omit the device address (= <DeviceNo>) from the command.

**Example:**

Command: <CommandCode><CommandParameters><CHCK><ETX>

Response <Status><Data><CHCK><ETX>

You also have the option of replacing <CHCK><ETX> with #<CR>.

A new command can be sent only after a response to the previous command has been received.

### Version VE

This command transfers the software version.

Command: VE <CHCK> <ETX>

Response: <Status> (c) P+F IDENT-I  
<Type code>  
<Part no.>  
<SW no.>  
<Date> <CHCK> <ETX>

### Change Tag CT

This command configures the tag type with which the read/write unit is communicating. Type "40" is active by default.

Command: CT <TagType> <CHCK> <ETX>

Response: <Status> <CHCK> <ETX>

For supported read/write tags, please see see table "13.56 MHz/ISO 14443 Tag Types" on page 8.

Using type <TagType> = "40", it is possible to achieve mixed operation of different read-only and read/write tags. However, this setting can only be used to read read-only codes (UID).

### Quit QU

All active enhanced-buffered read or write commands are canceled.

Command: QU <CHCK> <ETX>

Response: <Status> <CHCK> <ETX>

## Configure Interface CI

This command configures the timeout and the baud rate. The values are stored in the nonvolatile memory. Any modifications become active only after a reset has been performed.

The timeout is the time after which the R/W system no longer waits for characters in a command. After the timeout expires, the user receives an error message. To deactivate the timeout, the time must be set to "0".

The number of data bits is always eight. A parity bit is not used.

Command: CI <Timeout>, <Baud> <CHCK> <ETX>  
Response: <Status> <CHCK> <ETX>

The following settings are possible:

<Timeout>: "0" ... "100" (x 100 ms, timeout in 100-ms steps)  
<Baud>: "1200", "2400", "4800", "9600", "19,200", "38,400"

The default values are a timeout of "0" and a baud rate of "38,400".

## Reset RS

This command is used to revert modified system settings, e.g., the timeout and baud rate settings, back to the values stored in the nonvolatile memory.

Command: RS <CHCK> <ETX>  
Response: "2" <CHCK> <ETX>

## Configuration Store CS

<Param> = "1" stores the next command in this setting in the nonvolatile memory. This command is executed. Following a reset, this command is automatically reactivated.

If <Param> = "0", the stored command is deleted.

Command: CS <Param> <CHCK> <ETX>  
Response: <Status> <CHCK> <ETX>

## Get State GS

This command is used to read the settings stored in the nonvolatile memory of the R/W system. These settings become active after the next system reset.

Command: GS <CHCK> <ETX>  
Response: <Status> TO:<Timeout> BD:<Baud>  
HD1:<Status><TagType><CHCK><ETX>

## 4.4 Read/Write Commands in Point-to-Point Operation (Single Drop)

### Single Read Words SR

The R/W system makes only one attempt to read <WordNum> 32-bit words from the address <WordAddr>.

Command: SR <WordAddr> <WordNum> <CHCK> <ETX>  
Response: <Status> <Data> <CHCK> <ETX>



### Enhanced Buffered Read Words ER

The R/W system continuously attempts to read <WordNum> 32-bit words from the address <WordAddr>. Variable data is transferred via the interface.

When a read/write tag leaves the detection range, the status '05h' (read command) is output.

Command: ER <WordAddr> <WordNum> <CHCK> <ETX>  
Response: <Status> <Data> <CHCK> <ETX>

### Single Write Words SW

The R/W system makes only one attempt to write <WordNum> 32-bit words from the address <WordAddr>.

Command: SW <WordAddr> <WordNum> <Data> <CHCK> <ETX>  
Response: <Status> <CHCK> <ETX>

### Enhanced Buffered Write Words EW

The R/W system repeatedly attempts to write <WordNum> 32-bit words from the address <WordAddr> until successful. Once it has successfully read a code, the status '00h' is output.

The status '05h' is only output when a read/write tag leaves the detection range or is not yet within the detection range. The command remains active.

Command: EW <WordAddr> <WordNum> <Data> <CHCK> <ETX>  
Response: <Status> <CHCK> <ETX>

### Fill Datacarrier S#

The word number <WordNum> of fill signs <Fill Sign> is written to the read/write tag from the specified start address <WordAddr>.

Command: S# <WordAddr> <WordNum> <Fill Sign> <CHCK> <ETX>  
Response: <Status> <CHCK> <ETX>

### Single Read Read-Only Code SF

The R/W system makes only one attempt to read a read-only code.

Command: SF <CHCK> <ETX>  
Response: <Status> <Data> <CHCK> <ETX>

### Enhanced Buffered Read Read-Only Code EF

The R/W head makes attempts until successful to read a read-only code. Once it has successfully read a code, the status '00h' is output.

The status '05h' (read command) is output whenever a read/write tag leaves the detection range. The command remains active.

Command: EF <CHCK> <ETX>  
Response: <Status> <Data> <CHCK> <ETX>

## 4.5 System Commands in Multidrop Mode



### **Note!**

#### **Command Syntax**

IQT2-\* -R4-V1 read/write stations can be set to multidrop mode. In this mode, the read/write station responds immediately, i.e., confirms whether the reader has understood the command. The reader then starts to execute the command. The 'GD' command must be used to determine whether the command has actually been executed successfully (polling mode). The device address must be specified in the commands.

If your read/write station is not operating in multidrop mode, omit the device address (= <DeviceNo>) from the command.

#### **Example:**

Command: <CommandCode><DeviceNo><CommandParameters><CHCK><ETX>

Response: <Status><DeviceNo><Data><CHCK><ETX>

You also have the option of replacing <CHCK><ETX> with #<CR>.

A new command can be sent only after a response to the previous command has been received.

### **Define Function DF**

This command switches the system from single-drop mode to multidrop mode and vice versa:

Single drop --> multidrop:  
DF42<CHCK><ETX>

Multidrop --> single drop:  
DF<DeviceNo>41<CHCK><ETX>

After changing the operating mode, a power supply reset or an 'RS' command must be executed to activate the required operating mode.

### **version VE**

This command transfers the software version.

Command: VE <DeviceNo> <CHCK> <ETX>  
Response: <Status> <DeviceNo> (c) P+F IDENT-I  
<Type code>  
<Part no.>  
<SW no.>  
<Date> <CHCK> <ETX>

### **Set Device Address SD**

This command changes the device address in multidrop mode from <OldDeviceNo> to <NewDeviceNo>. The default device address is "FF".

Command: SD <OldDeviceNo> <NewDeviceNo> <CHCK> <ETX>  
Response: <Status> <DeviceNo> <CHCK> <ETX>

### **Get Device Address GA**

This command reads the device address of a R/W system.

Command: GA <CHCK> <ETX>  
Response: <Status> <DeviceNo> <DeviceNo> <CHCK> <ETX>



## Change Tag CT

This command configures the tag type with which the read/write unit is communicating. Type "40" is active by default.

Command: CT <DeviceNo> <TagType> <CHCK> <ETX>  
Response: <Status> <DeviceNo> <CHCK> <ETX>

For supported read/write tags, please see see table "13.56 MHz/ISO 14443 Tag Types" on page 8.

Using type <TagType> = "40", it is possible to achieve mixed operation of different read-only and read/write tags. However, this setting can only be used to read read-only codes (UID).

## quit QU

The running enhanced-buffered read or write commands are canceled.

Command: QU <DeviceNo> <CHCK> <ETX>  
Response: <Status> <DeviceNo> <CHCK> <ETX>

## configure interface CI

This command sets the timeout and the baud rate. The values are stored in a non-volatile manner. A change always requires a reset to take effect.

The timeout indicates the amount of time, after which the device no longer waits for more characters in a command. After the timeout runs through, the user gets an error message. To deactivate the timeout, the time must be set to "0".

The number of data bits is always 8. A parity bit is never used.

Command: CI <DeviceNo> <Timeout>, <Baud> <CHCK> <ETX>  
Response: <Status> <DeviceNo> <CHCK> <ETX>

The following settings are possible:

<Timeout>: "0" ... "100" (x 100 ms, timeout in 100-ms steps  
<Baud>: "1200" , "2400" , "4800" , "9600" , "19200" , "38400"

The default values are a timeout of "0" and a baud rate of "38400".

## reset RS

This command sets the changed system settings, e.g. timeout and baud rate, newly loaded from the non-volatile memory.

Command: RS <DeviceNo> <CHCK> <ETX>  
Response: "2" <DeviceNo> <CHCK> <ETX>

## Command Store CS

<Param> = "1" stores the next command in this setting in the nonvolatile memory. This command is executed. After a reset or an interruption of the power supply, this command is automatically reactivated.

If <Param> = "0", the stored command is deleted.

Command: CS <DeviceNo> <Param> <CHCK> <ETX>  
Response: <Status> <DeviceNo> <CHCK> <ETX>

### Get Data GD

This command retrieves the data from the read station. Each data record is transferred only once.

Data is only available for read commands. There is no data component for write commands.

Command: GD <DeviceNo> <CHCK> <ETX>  
Response: <Status> <DeviceNo> <ExecCounter>{<Data>}<CHCK> <ETX>

### Repeat Response RR

This command triggers a repeat of the last telegram received on 'GD'.

Command: RR <DeviceNo><CHCK> <ETX>  
Response: <Status> <DeviceNo> <ExecCounter>{<Data>}<CHCK> <ETX>

### Get State GS

This command is used to read the settings stored in the nonvolatile memory of the R/W system.

Command: GS <DeviceNo> <CHCK> <ETX>  
Response: <Status> <DeviceNo> TT: <TagType>, TO:<Timeout> ms, BD:<Baud>  
<CHCK><ETX>

## 4.6 Read/Write Commands in Multidrop Mode

### Single Read Words SR

The R/W system makes only one attempt to read <WordNum> 32-bit words from the address <WordAddr>.

Command: SR <DeviceNo> <WordAddr> <WordNum> <CHCK> <ETX>  
Response: <Status> <DeviceNo> <CHCK> <ETX>

### Enhanced Buffered Read Words ER

The R/W system continuously attempts to read <WordNum> 32-bit words from the address <WordAddr>.

Command: ER <DeviceNo> <WordAddr> <WordNum> <CHCK> <ETX>  
Response: <Status> <DeviceNo> <CHCK> <ETX>

### Single Write Words SW

The R/W system makes only one attempt to write <WordNum> 32-bit words from the address <WordAddr>.

Command: SW <DeviceNo> <WordAddr> <WordNum> <Data> <CHCK> <ETX>  
Response: <Status> <DeviceNo> <CHCK> <ETX>

### Enhanced Buffered Write Words EW

The R/W system repeatedly attempts to write <WordNum> 32-bit words from the address <WordAddr> until successful.

The command remains active.



Command: EW <DeviceNo> <WordAddr> <WordNum> <Data> <CHCK> <ETX>  
Response: <Status> <DeviceNo> <CHCK> <ETX>

### Single Write Words with Lock SL

This command works in the same way as a normal write command. Once writing is completed, the data from before the overwriting process is protected, provided that the read/write tags offer this function. The write protection is permanent and cannot be undone.

Command: SL <DeviceNo> <WordAddr> <WordNum> <Data> <CHCK> <ETX>  
Response: <Status> <DeviceNo> <CHCK> <ETX>

### Enhanced Write Words with Lock EL

This command works in the same way as a normal write command. Once writing is completed, the data from before the overwriting process is protected, provided that the read/write tags offer this function. The write protection is permanent and cannot be undone.

Command: EL <DeviceNo> <WordAddr> <WordNum> <Data> <CHCK> <ETX>  
Response: <Status> <DeviceNo> <CHCK> <ETX>

### Fill Datacarrier S#

The word number <WordNum> of fill signs <Fill Sign> is written to the read/write tag from the specified start address <WordAddr>.

Command: S# <DeviceNo> <WordAddr> <WordNum> <Fill Sign> <CHCK> <ETX>  
Response: <Status> <DeviceNo> <CHCK> <ETX>

### Single Read Read-Only Code SF

The R/W system makes only one attempt to read a read-only code.

Command: SF <DeviceNo> <CHCK> <ETX>  
Response: <Status> <DeviceNo> <CHCK> <ETX>

### Enhanced Buffered Read Read-Only Code EF

The R/W head makes attempts until successful to read a read-only code.

Command: EF <DeviceNo> <CHCK> <ETX>  
Response: <Status> <DeviceNo> <CHCK> <ETX>



## 4.7

### Legend

<CHCK>:	1 ASCII character, 8 bit checksum with the addition of all preceding characters, without overrun.
<CR>:	1 ASCII character 13
<Data>:	<WordNum> times 4 octets.
<DeviceNo>:	2 ASCII characters
<ExecCounter>:	<ul style="list-style-type: none"> <li>■ '-': No command active</li> <li>■ 'Ø': Command active, no new read/write tags read or written since last polling.</li> <li>■ '1': Read/write tag successfully read or written</li> <li>■ '≥2': Several tags detected in read/write range since last polling. There is a risk that data read has not been transferred!</li> </ul>
<ETX>:	1 ASCII character 03
<Status>:	1 ASCII character: <ul style="list-style-type: none"> <li>■ '0': Command executed successfully</li> <li>■ '2': Switch-on message</li> <li>■ '4': Syntax error in command</li> <li>■ '5': No read/write tag in detection range</li> <li>■ '6': Hardware error</li> </ul>
<SW-No>:	Application software number
<TagType>:	2 ASCII characters
<Timeout>:	Interface timeout: An error message is sent after this time runs out. 1–3 ASCII characters, in ms.
<WordAddr>:	Word start address in the read/write tag, 4 ASCII characters, range from "0000" to "FFFF" depending on tag type.
<WordNum>:	Number of data blocks to be read or written (each 4 octets), 2 ASCII characters. Range from "01" to "20" depending on tag type ( ).

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